Flint Update

August 12, 2016

Virginia Tech
Invent the Future

1) A special study of water heater flushing and Legionella testing (led by William Rhoads and Taylor Bradley and funded by the State of Michigan)

2) Third round of lead in water testing
(led by Ms. LeeAnne Walters, Flint residents and funded by EPA)

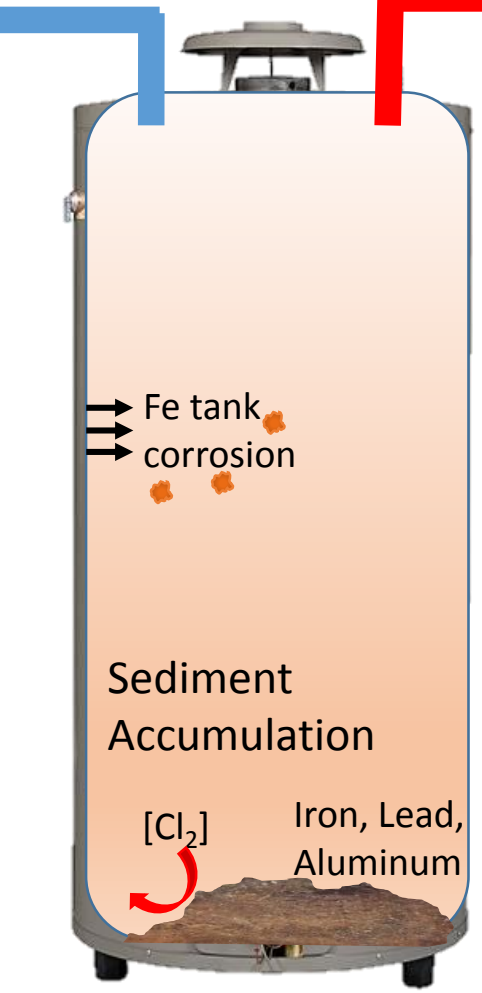
3) Second round of water heater disinfection by-product testing (led by Dr. Dave Reckhow, a team at the University of Massachusetts-Amherst and funded by the EPA)

Flint Water Heater Study

June 20-July 1

Led by: William Rhoads, PhD candidate

Taylor Bradley, MS Candidate



Legionella Growth in Water Heaters

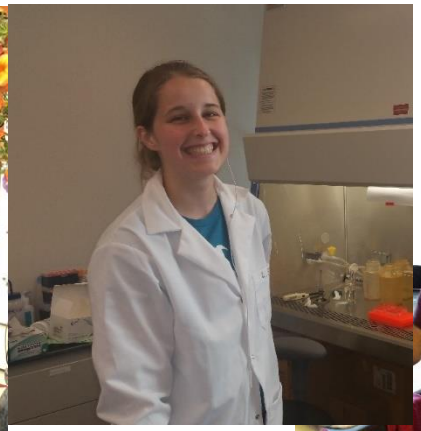
- Sediment accumulation (calcium carbonate, sand, corrosion byproducts)
  - Sediment interferes with chlorine residuals
- Temperature within the tank
  - Gradient
  - Water heater setting

Rapid chlorine decay + Sedimentation + Low Temperatures = Legionella growth?

Goals

- assess the quantity and composition of sediment accumulated in Flint water heaters,
- determine the extent of *Legionella* colonization in Flint water heaters and home plumbing,
- develop and test the effectiveness of a water heater cleaning procedure for removing sediment, and determine if removing sediment improves water quality.

Study Logistics



2 Weeks
30 Homes; 4 electric, 26 gas
2 Teams of 7 Students
3 Community Volunteers
3 Plumbers

Hypothesis 1:

Flushing water heaters will remove accumulated sediment and lower levels of inorganic contaminant concentrations (i.e., lead, iron, copper) in consumer hot water.

1. Flushing did not change levels of lead, iron, or copper at taps within homes or the water heater drain valve.

Hypothesis 2:

Removing accumulated sediment from water heaters will allow chlorine to remain more stable, increasing the level of chlorine residuals in the hot water.

- Median chlorine in cold flushed samples was 0.6 mg/L as Cl_2 both before and after flushing

1. Flushing did not change chlorine in any sample location
2. Chlorine levels in distributions system water were generally high

Hypothesis 3:

There is very low colonization of *Legionella* in residential water heaters

If there is culturable *Legionella*, the levels will improve with flushing

1. *Legionella* colonization rates in Flint homes were very low
2. Flushing did not eliminate or reduce the incidence of *Legionella*

Recommendations

- A one-time, short-term cleaning program to improve the water quality in residential home plumbing is not recommended for *Legionella* control or reducing inorganic contaminants

Acknowledgements

- Flint Water Study Team
- MDEQ
- Orchard Children Services
- Flint Residents

Flint resident sampling: August 2015 - July 2016

Kelsey Pieper, Min Tang,
Anurag Mantha and Marc Edwards

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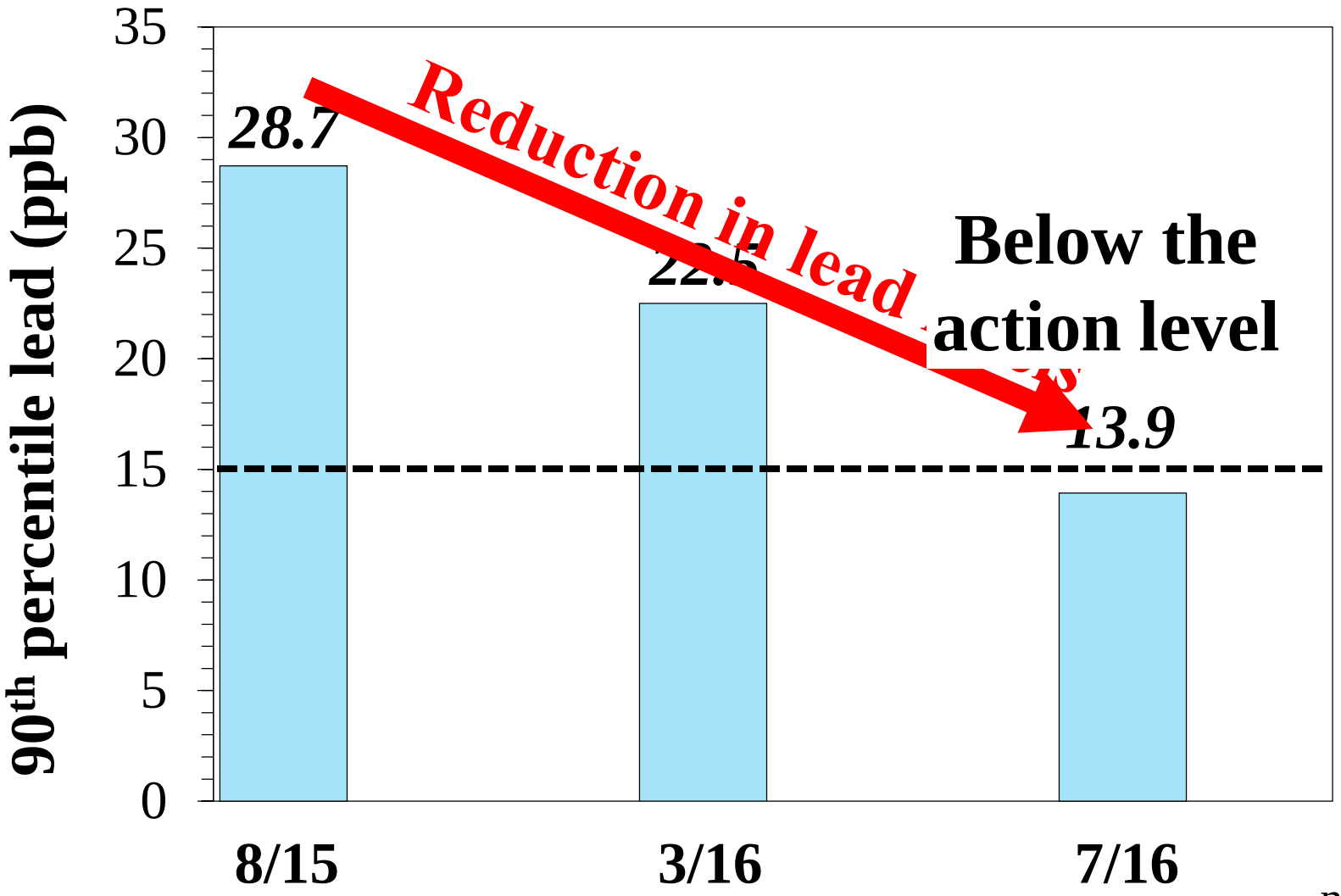
Sampling in July 2016

- Sampling organized by LeeAnne Walters and the Flint citizen science team
- Kits were distributed from 2 Flint churches
  - If requested, team delivered and picked up kits

First draw lead in Jul. 2016



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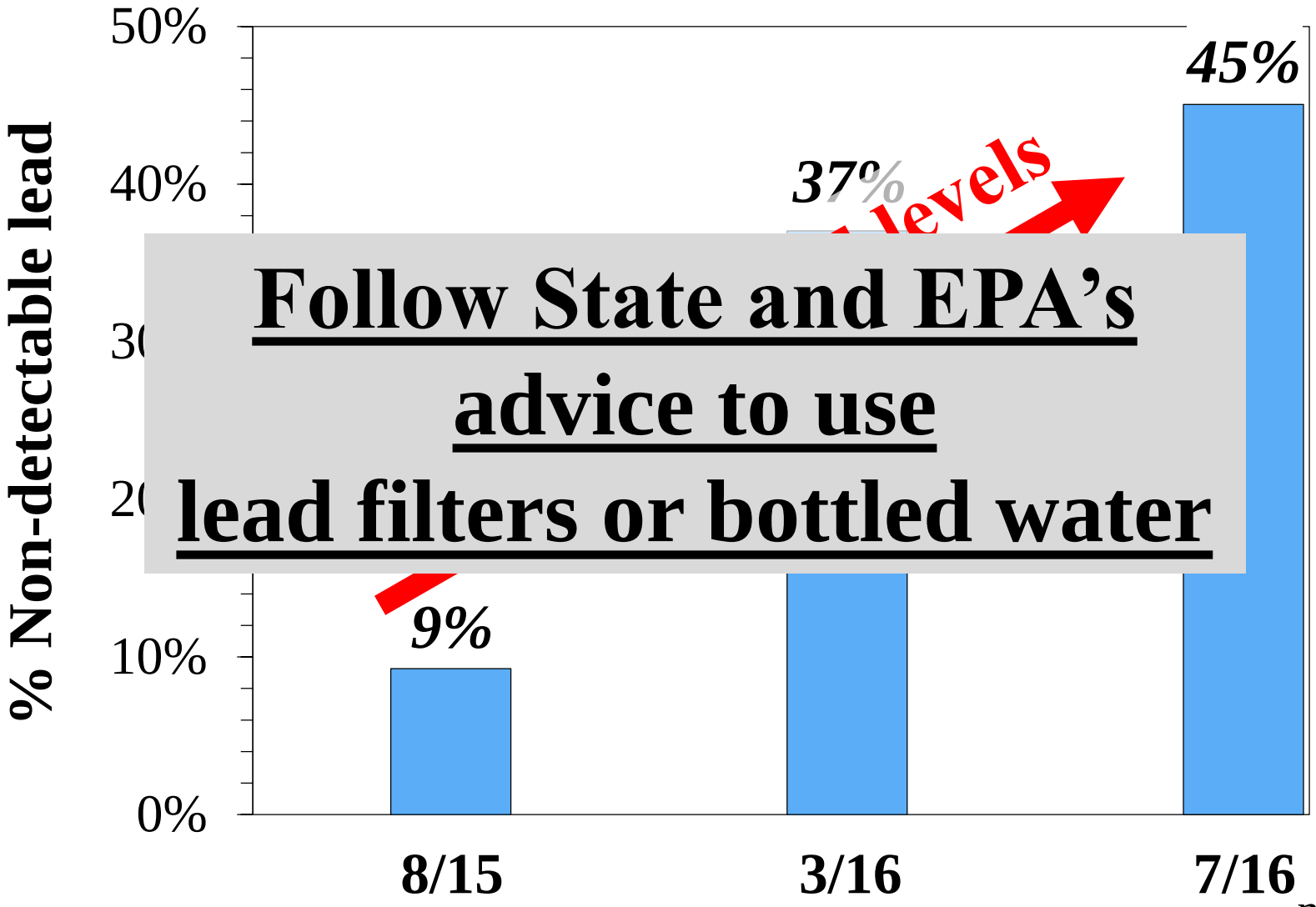
First draw lead levels



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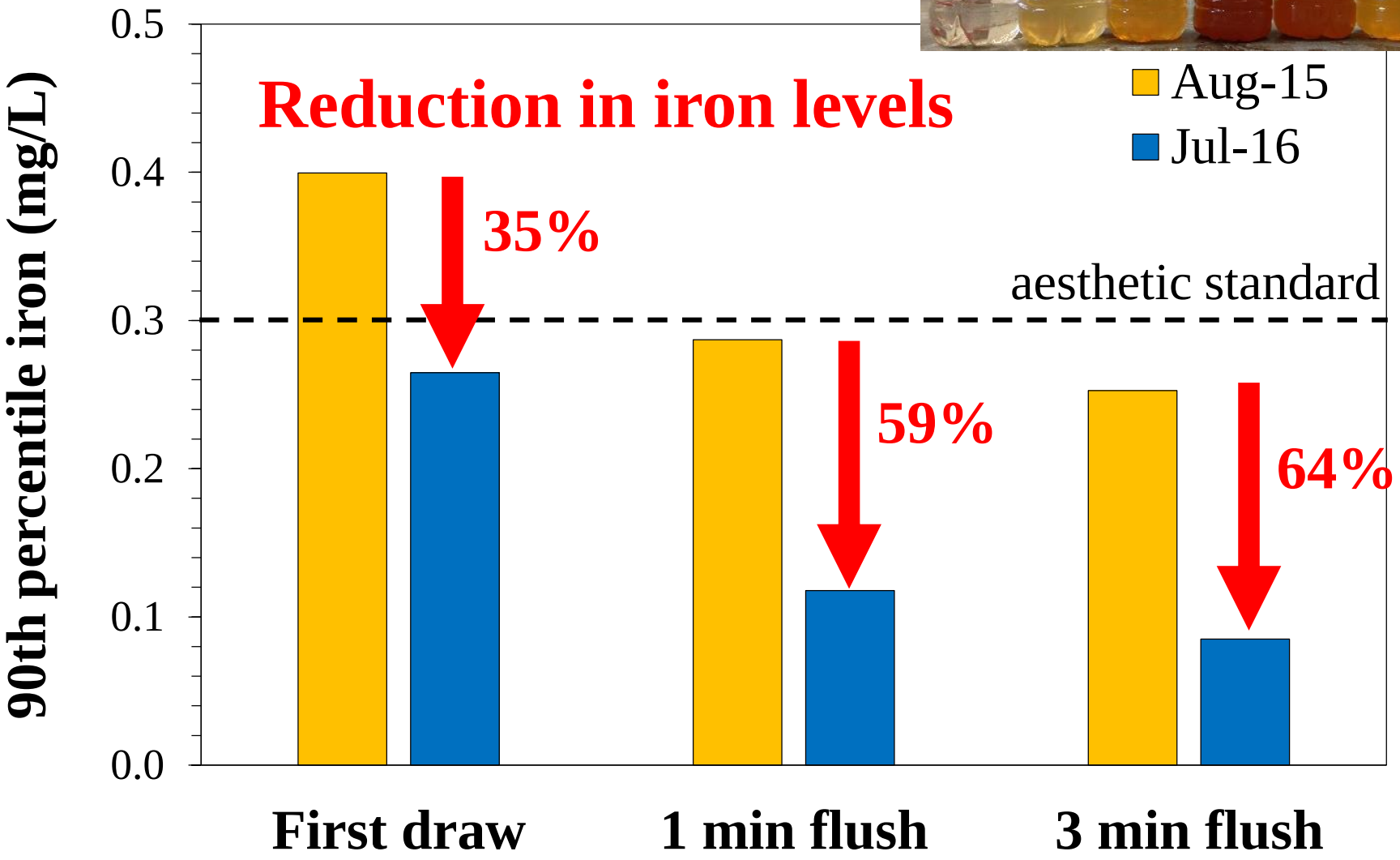
Iron concentrations



Conclusions

1. It is now possible that Flint is meeting the lead action level
   - However, this is not an approved LCR sampling pool

2. Lead and iron levels have decreased since August 2015

3. Residents should use lead filters or bottled water until further notice from the State or EPA

Flint DBPs

Dave Reckhow
University of Massachusetts
Amherst, MA

Research Funded by EPA. These comments have not been reviewed by EPA nor do they necessarily reflect the views of the EPA.

KEY POINTS (5-31-2016 Press Conference)

- CHLOROFORM, THMs and OTHER DBPs ARE EXPECTED IN THE WATER OF EVERY CITY USING CHLORINE
- IF WE DID NOT USE CHLORINE, VERY HIGH LEVELS OF WATERBORNE DISEASE AND DEATHS WOULD OCCUR, INCLUDING LEGIONAIRRES DISEASE
- ALL AVAILABLE DATA SHOW REASONABLE AND EXPECTED LEVELS OF CHLOROFORM, TTHMs and OTHER DBPs IN FLINT SINCE RETURNING to DETROIT WATER
- NOTHING UNUSUAL DETECTED BY EPA OR UMASS, EVEN FROM FLINT WATER HEATERS

New Sampling By UMass

Members of the UMass Flint DBP Team:
Dr. Dave Reckhow (Team Lead)
Dr. Joe Goodwill (DBP sampling, THMs, Iodo-THMs and other volatiles)
Yanjun Jiang (Iodo-THMs and other volatiles)
Xuyen Mai (DBP sampling)
Xian “Max” Ma (DBP sampling, Haloacetamides)
Ran Zhao (Haloacetamides and HAAs)
Soon-Mi Kim (Haloacids)
Yun “Rosa” Yu (N-halo-haloacetamides)
Aarthi Mohan (Halobenzoquinones)
Pranav Mashankar (Aldehydes)
Sherrie Webb-Yagodzinski (Sampling preparation)

KEY POINT (8-11-2016 Press Conference)

- NOTHING UNUSUAL DETECTED BY EPA OR UMASS, EVEN FROM FLINT WATER HEATERS